WHAT IS CLAIMED IS:

1. A magnetic sensing element comprising a laminate, the laminate including: a first antiferromagnetic layer; a pinned magnetic layer, a magnetization direction thereof being pinned by the first antiferromagnetic layer; a nonmagnetic conductive layer; a free magnetic layer, a magnetization direction thereof being variable in response to an external magnetic field; a nonmagnetic interlayer; a ferromagnetic layer; and a second antiferromagnetic layer, which magnetically couples with the ferromagnetic layer to orient a magnetization of the ferromagnetic layer in a predetermined direction,

wherein the laminate has a recess extending through the second antiferromagnetic layer and the ferromagnetic layer, a bottom face of the recess lying in the nonmagnetic interlayer, a width of the bottom face in a track width direction being equal to a track width; and

wherein the free magnetic layer is magnetized in a direction substantially orthogonal to the magnetization direction of the pinned magnetic layer as a result of magnetic coupling with the ferromagnetic layer.

2. The magnetic sensing element according to Claim 1, wherein the nonmagnetic interlayer comprises at least one metal selected from the group consisting of Ru, Rh, Ir, Cr, Re, and Cu.

3. The magnetic sensing element according to Claim 1, wherein at least one of the ferromagnetic layer and the free magnetic layer comprises a CoFeNi alloy containing about 9 to about 17 atomic percent of Fe, about 0.5 to about 10 atomic percent of Ni, and a balance of Co.

4. The magnetic sensing element according to Claim 1, wherein the laminate further includes an interlayer disposed between the free magnetic layer and the nonmagnetic conductive layer the interlayer comprising one of a CoFe alloy and elemental Co, the interlayer.

5. The magnetic sensing element according to Claim 4, wherein at least one of the ferromagnetic layer and the free magnetic layer comprises a CoFeNi alloy containing about 7 to about 15 atomic percent of Fe, about 5 to about 15 atomic percent of Ni, and a balance of Co.

6. The magnetic sensing element according to Claim 3, wherein both the ferromagnetic layer and the free magnetic layer comprise the CoFeNi alloy.

7. The magnetic sensing element according to Claim 1, wherein side faces of the recess are perpendicular to the track width direction.

8. The magnetic sensing element according to Claim 1, the laminate further comprising a nonmagnetic layer disposed between the ferromagnetic layer and the second antiferromagnetic layer.

9. The magnetic sensing element according to Claim 8, wherein the nonmagnetic layer comprises at least one element selected from the group consisting of Ru, Cu, Ag, and Au.

10. The magnetic sensing element according to Claim 9, wherein the nonmagnetic layer comprises Ru and has a thickness in the range of about 8 to about 11 Å.

11. The magnetic sensing element according to Claim 1, the laminate further comprising a third antiferromagnetic layer disposed under the second antiferromagnetic layer.

12. The magnetic sensing element according to Claim 11, wherein the third antiferromagnetic layer has a thickness of not more than about 30 Å.

13. The magnetic sensing element according to Claim 1, wherein the pinned magnetic layer comprises: a plurality of ferromagnetic sublayers each differing in a magnitude of a magnetic moment per unit area, and at least one nonmagnetic intermediate sublayer separating the plurality of ferromagnetic sublayers from one another, and

wherein magnetization directions of the plurality of ferromagnetic sublayers are antiparallel to each other.

14. The magnetic sensing element according to Claim 13, wherein said at least one nonmagnetic intermediate sublayer comprises one metal selected from the group consisting of Ru, Rh, Ir, Cr, Re, and Cu.

15. The magnetic sensing element according to Claim 1, wherein the first antiferromagnetic layer and the second antiferromagnetic layer comprise the same antiferromagnetic material.

16. The magnetic sensing element according to Claim 1, wherein at least one of the first and second antiferromagnetic layers comprises one of a PtMn alloy, an X-Mn alloy, and a Pt-Mn-X' alloy, wherein X is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, Os, Ni, and Fe, and X' is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, Au, Ag, Os, Cr, Ni, Ar, Ne, Xe, and Kr.

17. A method for making a magnetic sensing element, the method comprising the steps of:

(a) depositing a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic conductive layer, a free magnetic layer, a nonmagnetic interlayer, a

ferromagnetic layer, and a protective layer on a substrate to form a laminate;

(b) annealing the laminate at a first annealing temperature in a first magnetic field so as to pin a magnetization direction of the pinned magnetic layer in a predetermined direction;

(c) removing the protective layer and a predetermined thickness of the ferromagnetic layer;

(d) redepositing the ferromagnetic layer using a magnetic material and sequentially depositing a second antiferromagnetic layer on the ferromagnetic layer;

(e) annealing the laminate and the second antiferromagnetic layer at a second annealing temperature in a second magnetic field so as to orient a magnetization direction of the free magnetic layer in a direction substantially orthogonal to the magnetization direction of the pinned magnetic layer; and

(f) depositing a pair of resist layers on the second antiferromagnetic layer, said pair of resist layers being separated from each other by a gap corresponding to a track width, and removing a portion of the second antiferromagnetic layer intermediate to the pair of resist layers in a direction perpendicular to a track width direction so as to form a recess.

18. A method for making a magnetic sensing element, the method comprising the steps of:

(a) depositing a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic conductive layer, a free magnetic layer, a nonmagnetic interlayer, a ferromagnetic layer, and a third antiferromagnetic layer on a substrate to form a laminate;

(b) annealing the laminate at a first annealing temperature in a first magnetic field so as to pin a magnetization direction of the pinned magnetic layer in a predetermined direction;

(c) depositing a second antiferromagnetic layer on the laminate;

(d) annealing the laminate and the second antiferromagnetic layer at a second annealing temperature in a second magnetic field so as to orient a magnetization direction of the free magnetic layer in a direction substantially orthogonal to the magnetization direction of the pinned magnetic layer; and

(e) depositing a pair of resist layers on the second antiferromagnetic layer, said pair of resist layers being separated from each other by a gap corresponding to a track width, and removing a portion of the second antiferromagnetic layer intermediate to the pair of resist layers in a direction perpendicular to a track width direction so as to form a recess.

19. The method for making the magnetic sensing element according to Claim 18, said step (a) further comprising

depositing a nonmagnetic layer on the ferromagnetic layer.

20. The method for making the magnetic sensing element according to Claim 19, wherein the ferromagnetic layer is magnetized in a direction substantially orthogonal to the magnetization direction of the pinned magnetic layer as a result of an RKKY interaction with the third antiferromagnetic layer.

21. The method for making the magnetic sensing element according to Claim 19, wherein the nonmagnetic layer comprises at least one element selected from the group consisting of Ru, Cu, Ag, and Au.

22. The method for making the magnetic sensing element according to Claim 17, wherein at least one of the ferromagnetic layer and the free magnetic layer comprises a CoFeNi alloy of about 9 to about 17 atomic percent of Fe, about 0.5 to about 10 atomic percent of Ni, and a balance of Co.

23. The method for making the magnetic sensing element according to Claim 17, wherein step (a) further comprises depositing an interlayer comprising one of a CoFe alloy and elemental Co between the nonmagnetic conductive layer and the free magnetic layer.

24. The method for making the magnetic sensing element according to Claim 23, wherein at least one of the ferromagnetic layer and the free magnetic layer comprises a CoFeNi alloy about 7 to about 15 atomic percent of Fe, about 5 to about 15 atomic percent of Ni, and a balance of Co.

25. The method for making the magnetic sensing element according to Claim 22, wherein both the ferromagnetic layer and the free magnetic layer comprise the CoFeNi alloy.

26. The method for making the magnetic sensing element according to Claim 17, wherein step (f) further comprises forming a recess having a bottom face lying in the second antiferromagnetic layer.

27. The method for making the magnetic sensing element according to Claim 26, wherein a thickness of a portion of the second antiferromagnetic layer under the bottom face of the recess is not more than about 30 Å.

28. The method for making the magnetic sensing element according to Claim 17, wherein step (f) further comprises forming a recess having a bottom face lying in the ferromagnetic layer.

29. The method for making the magnetic sensing element according to Claim 17, wherein step (f) further comprises

forming a recess having a bottom face lying in the nonmagnetic interlayer.

30. The method for making the magnetic sensing element according to Claim 18, wherein step (e) further comprises forming a recess having a bottom face lying in the third antiferromagnetic layer.

31. The method for making the magnetic sensing element according to Claim 30, wherein a portion of the third antiferromagnetic layer under the bottom face of the recess has a thickness of not more than about 30 Å.

32. The method for making the magnetic sensing element according to Claim 19, wherein step (e) further comprises forming a recess having a bottom face lying in the nonmagnetic layer.

33. The method for making the magnetic sensing element according to Claim 17, wherein the second annealing temperature is lower than a blocking temperature of the first antiferromagnetic layer.

34. The method for making the magnetic sensing element according to Claim 17, wherein the magnitude of the second magnetic field is smaller than a magnitude of an exchange anisotropic magnetic field of the first antiferromagnetic

layer.

35. The method for making the magnetic sensing element according to Claim 17, wherein said step (f) is replaced with the step of:

depositing a pair of electrode layers on the second antiferromagnetic layer, pair of electrode layers being separated from each other by a gap in a track width direction, and removing a portion of the second antiferromagnetic layer intermediate to the pair of electrode layers so as to form a recess having a width equal to a track width.

36. The method for making the magnetic sensing element according to Claim 17, wherein the pinned magnetic layer is formed by depositing a plurality of ferromagnetic sublayers differing in a magnitude of a magnetic moment per unit area and at least one nonmagnetic intermediate sublayer separating said plurality of ferromagnetic sublayers from one another.

37. The method for making the magnetic sensing element according to Claim 36, wherein the at least one nonmagnetic intermediate sublayer comprises at least one metal selected from the group consisting of Ru, Rh, Ir, Cr, Re, and Cu.

38. The method for making the magnetic sensing element

according to Claim 17, wherein the first and second antiferromagnetic layers comprise the same antiferromagnetic material.

39. The method for making the magnetic sensing element according to Claim 17, wherein at least one of the first and second antiferromagnetic layers comprises one of a PtMn alloy, an X-Mn alloy, and a Pt-Mn-X' alloy, wherein X is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, Os, Ni, and Fe, and X' is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, Au, Ag, Os, Cr, Ni, Ar, Ne, Xe, and Kr.

40. The method for making the magnetic sensing element according to Claim 18, wherein said step (e) further comprises forming a recess having a bottom face lying in the second antiferromagnetic layer.

41. The method for making the magnetic sensing element according to Claim 40, wherein a total thickness of a portion of the second antiferromagnetic layer under the bottom face of the recess and the third antiferromagnetic layer is not more than about 30 Å.

42. The method for making the magnetic sensing element according to Claim 18, said step (e) further comprises forming a recess having a bottom face lying in the

ferromagnetic layer.

43. The method for making the magnetic sensing element according to Claim 18, said step (e) further comprising forming a recess having a bottom face lying in the nonmagnetic interlayer.

44. The method for making the magnetic sensing element according to Claim 18, wherein the second annealing temperature is lower than a blocking temperature of the first antiferromagnetic layer.

45. The method for making the magnetic sensing element according to Claim 18, wherein the magnitude of the second magnetic field is smaller than a magnitude of an exchange anisotropic magnetic field of the first antiferromagnetic layer.

46. The method for making the magnetic sensing element according to Claim 18, wherein said step (e) is replaced by the step of:

depositing a pair of electrode layers on the second antiferromagnetic layer, said pair of electrode layers being separated from each other by a gap in a track width direction, and removing a portion of the second antiferromagnetic layer intermediate to the pair of electrode layers so as to form a recess having a width equal

to a track width.